Detection of Formalin Content And Quality Properties of Snakehead (*Channa striata*) Dried Salted Fish From The Traditional Markets In Pontianak City In Indonesia

Eva Mayasari[*], Muhammad Azlan, Tri Rahayuni

Programme of Study in Food Technology, Faculty of Agriculture, Tanjungpura University, Jalan Prof. Dr. H. Hadari Nawawi Pontianak, West Kalimantan 78124, Indonesia

eva.mayasari@faperta.untan.ac.id

Abstract. The snakehead fish (Channa striata) dried salted fish is one of the freshwater salted fish favored by local people in Pontianak city, West Kalimantan, Indonesia. The aim of this research was to identify the formalin content and status of the quality properties of the Snakehead dried salted fish in the traditional markets in Pontianak city. Sampling is carried out in five traditional market selected i.e. Mawar, Dahlia, Puring, Kenanga dan Flamboyan. The determination of formalin was carried out by qualitative and quantitative methods using the Schiff reagent. All the samples are appropriate with SNI standard in salt content ranged from 7,08-8,49% and water content ranged from 36,66 – 39,04%. The level of panelists acceptance for appearance score ranged from 6,70–7,06 (whole, clean, slight dullness), the odor score ranged from 6,26 – 6,93 (neutral, slight odor additive - slight natural odor, slight odor additive), and the texture score ranged from 6,48 – 7,36 (solid, some loss of elasticity-very firm, some loss of elasticity). All the samples are contained formalin ranged from 0,64-0,83 ppm. The total plate count (TPC) of the samples was found ranged from $2,1 \times 10^7$ - $7,0 \times 10^7$ Cfu/g.

Keywords: *Channa striata, formalin, sensory, schiff reagent, snakehead fish, TPC*

1. Introduction

The snakehead fish (Channa striata), is locally known as 'Gabus' in Pontianak, West Kalimantan, Indonesia. It is freshwater fish originating from Southeast Asian countries and regarded as a source of high quality protein and traditional medicine for several diseases (1). Based on the market survey, the snakehead dried salted fish is one of the freshwater salted fish favored by local people compare to other types freshwater salted fish. The dried salted fish is food ingredient made from fish preserved by adding a lot of salt (2). Preservation of fish using salt in combination with drying has been known for thousands of years and it is a simple method that prolongs its shelf life (3).

The misuse of formalin as a food preservative is widely used in foodstuffs such as salted fish, fresh fish, meats and others (4). The previous studies in some regions in Indonesia have shown positively containing formalin (5,6,7). Formalin has described a solution of 37% formaldehyde gas mixed in water. A Formalin solution used in fish must contain 10-15% methanol that inhibits the formation of an exceedingly toxic compound. According to the International Agency for Research on Cancer (IARC) has categorized formaldehyde as a Group 1 carcinogenic to humans. In addition, the United States Environmental Protection

Agency (EPA), formaldehyde consumption in maximum daily dose reference (RfD) is 0.2 µg/g body weight per day (8).

The quality of salted fish must be fulfilled in order to be safe to consume. The National Agency for Drug and Food Control (BPOM) Regulations forbid that a product is free from toxic preservatives (9). The parameter that must be considered for dried salted fish is the presence of formalin and quality properties such as sensory and microbiology. Based on this information we attempted to identify the formalin content and status of the quality properties of the Snakehead dried salted fish in the traditional market in Pontianak city.

2. Methods

2.1. Sampling

Pontianak city has a large number of the traditional markets. There is five traditional market selected i.e. Mawar, Dahlia, Puring, Kenanga dan Flamboyan. The reason for these markets was chosen because of their location and large scale marketing of snakehead dried salted fish. The sampling technique is done by simple random sampling that conducted twice for a month of period sampling, therefore 30 samples were obtained.

2.2. Determination of Chemical Analysis

The determination of salt content was carried out using the Mohr method (12). 5 grams of the crushed sample was extracted with 10-20 ml of boiled distilled water. The extraction was repeated several times (8-10 times) until all the salt (NaCl) dissolves and separates from fat samples. The extraction results are filtered and diluted in distilled water with a ratio of 1 : 50 ml. The dilution solution was collected in Erlenmeyer, then added 1 ml of 5% K_2CrO_4, titrated with 0,1 N AgNO3 until the dark red is formed. Water content was evaluated using the gravimetric method (12). The sample is weighed until a constant weight is obtained that the water in the sample has been evaporated. The amount of water evaporated is the difference in weight before and after drying. The results of chemical analysis are compared with Indonesia National Standard (SNI) 01-2721-2009 about dried salted fish.

2.3. Sensory Analysis

Sensory analysis is used to determine the freshness the Snakehead dried salted fish according to SNI 01-2721-2009 (10). The scoring system has been developed to evaluate the sensory parameters. The quality sample evaluated by appearance, odor, texture. The panellist participated in sensory evaluation is the untrained panelist who is the student of Programme of Study in Food Technology, Faculty of Agriculture, Tanjungpura University. The panelists have presented a questionnaire in accordance with SNI 01-2721-2009 (Table 1), then panelists asked to give a score on the assessment sheet according to the quality level of the samples. Data presented of the average results on each panellists.

2.4. Determination of formalin

The determination of formalin is done by qualitative and quantitative methods (11). At first, samples are prepared to obtain the distillate. Ten gram samples were put into distillate flask, 50 ml of water was added, then acidified with 1 ml of 85% H_3PO_4. Distillate flask is connected to the condenser, then samples are distilled at 78-90°C. The distillation result is collected in a volumetric flask.

The qualitative method was carried out by the Schiff reagent of the color test. 1 ml of distillate put into a test tube, then 1 ml of Schiff reagent was added. The color of distillate samples was observed, if the red color is formed into a purple, therefore the samples is positive contained the formalin.

The Quantitive method was performed by the Schiff reagent and measured the absorbance of the distillate sample using a UV-Vis spectrophotometer. 5 ml of the distillate is taken, 1 ml of 96% H2SO4 is added trough the test tube wall, then 1 ml of Schiff reagent is added. The distillate samples quantified by the calibration curve of the external standard by formaldehyde standard at 550 nm.

Table 1. Determination of Freshness the Snakehead Dried Salted Fish According to SNI 01-2721-2009

Sensory Parameters

Appearance	Score
whole, neat, shining, typically	9
whole, clean, less tidy, shining, typically	8
whole, clean, slight dullness	7
whole, slight clean, slight dullness	6
Slight defect physically, slight clean, loss of bloom	5
Slight defect physically, discoloration	4
Incomplete physically, dirty	3
Defect physically, dull, the color changes from the specific type	1
Odor	
Natural odor	9
Slight natural odor	8
Slight natural odor, slight odor additive	7
Neutral, slight odor additive	6
Faint sour odor	5
Sour odor, ammonia odor	4
Unpleasant odor, strong ammonia odor	3
Rotten	1
Tekstur	
firm, elastic, and quite dry	9
firm, elastic, and less dry	8
Very firm, some loss of elasticity	7
Solid, some loss of elasticity	6
Solid, wet, slight floppy	5
Dry, limp, and floppy	3
Very limp and very floppy	1

2.5. Determination of Microbiological Analysis

Analysis of Total Plate Count is performed using the multilevel dilution (14). Plate count agar was obtained from PCA (Merk). 1 gram of the crushed sample put into 9 ml of sterile aquadest, homogenized to 10^{-1} dilution was obtained, and other dilution was prepared from that dilution until 10^{-5} dilution. Then inoculation was carried out using the pour plate method. Observed and calculated bacteria from the sample.

2.6. Statical Analysis

Data was collected statistically analyzed using descriptive test.

3. Results and discussion

3.1. Chemical Analysis

The result of salt content on samples ranged from 7,08- 8,49% (Figure 1). All of the samples showed appropriate with SNI 01-2721-2009 that the salt content does not exceed 20%. Water content on samples ranged from 36.66 – 39,04% (Figure 1). The same result as the salt analysis, the water content result showed appropriate with SNI 01-2721-2009 that the water content does not exceed 40%.

The water content is influenced by the salt content. The higher the salt content, the lower the water content on the material. Salt has hygroscopic properties that it makes absorb the water contained in fish (15). Salt is a chemical component that it is bacteriostatic and bacteriocidal. Bacteria can be killed by salt because of its hygroscopic ability. Salt can absorb water in the cells (cytoplasm) of bacteria, eventually, bacterial cells become contracted due to lack of fluids and die. In addition, Na^+ and Cl^- ions in salt are also toxic for some bacteria (16).
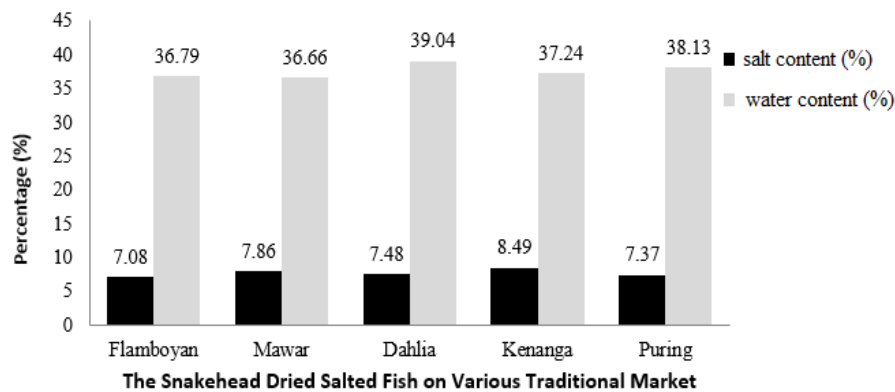

Figure 1. Chemical Analysis On The Snakehead Dried Salted Fish In The Traditional Market In Pontianak City

3.2. Sensory Analysis

Sensory analysis of the sample includes appearance, odour, and texture with a rating scale between 1-9. The higher the rating scale, the better of sample quality (Figure 2). The level of panelists acceptance for appearance score range from 6,70–7,06 (whole, clean, slight dullness). The average score showed that there is no physical damage and discoloration. The longer the storage causes bacterial activity in the salted fish will further overhaul the components present in fish and can produce brownish color. The odour score range from 6,26 – 6,93 (neutral, slight odor additive - slight natural odor, slight odor additive). The texture score from 6,48 – 7,36 (solid, some loss of elasticity-very firm, some loss of elasticity). The sample from Mawar market has a value below the SNI standard (minimum value of 6,5) for odor evaluation. This result suspected storage life during distribution and marketing of the Snakehead dried salted fish.

Odour is one of the parameters that determines the quality of salted fish. The quality of salted fish is influenced by the storage life, the longer the salted fish is stored will contact with free air its surrounding. Hence, the salted fish is contaminated microbial. The high amount of microbial makes microbial activity rapidly hidrolyze the protein bonds to form a foul odor (17).
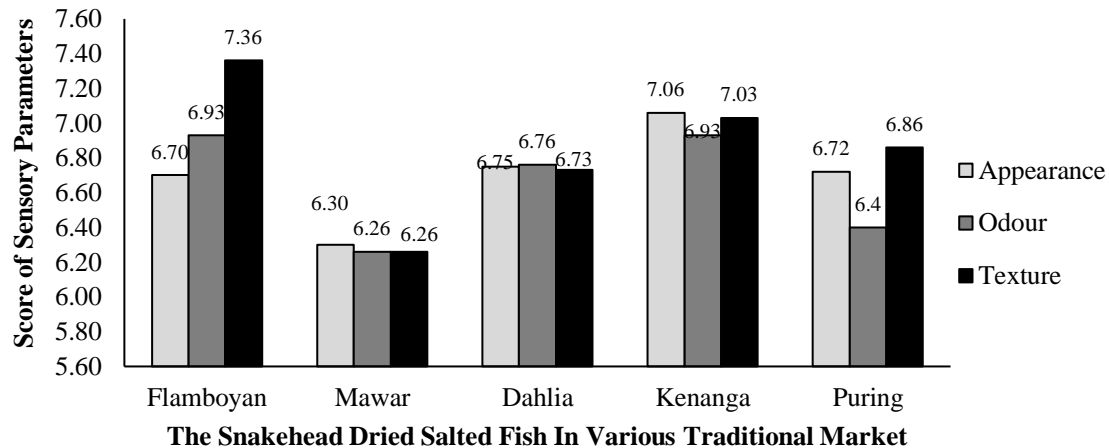
Figure 2. The Score of Sensory Parameters On the The Snakehead Dried Salted Fish In The Traditional Market In Pontianak City

3.3. Formalin Content

30 samples were observed, it did not change color when mixed with Schiff reagent. Therefore, we concluded that the samples from each traditional market were not identified or negative formalin qualitatively. The testing formalin reagents can detect the presence of formalin in foods in solid or liquid form with a minimum detection limit of 1-2 ppm (18). Based on this result, we assume that the samples were not identified formalin qualitatively because it has formalin content below 1 ppm.

The quantitative analysis resulted have the average level of formalin content on 30 sample range from 0,64 ppm - 0,83 ppm. The highest rate of formalin content was found in Puring market at 0,83 ppm while the lowest was found in (Figure 3). Based on European standards, formalin content that absorbs the body must not exceed 660 ppm (1000 ppm equivalent to 1 mg/ml) (18). The use of formalin content in food has been banned by the Government in the regulation of the Minister of Health of the Republic Indonesia No. 722/Menkes/Per/88 regarding food additives. This result assumed that the Snakehead dried salted from the traditional market in Pontianak city is at the threshold that can be absorbed by the body. However, the use of formalin as additive food is prohibited because it causes negative effects on health.

The use of formalin in dried salted fish aims to prevent fish from spoilage. Formalin accelerates the drying process and physical appearance not easily damaged. In addition, it also increases the yield of dried salted fish (18). There are many food products that contain dangerous and toxic chemicals. This is caused by various factors. The weak supervision conducted by the government on the distribution is one the reason for the uses of formalin in food products. In addition, low awareness and responsibility of food product manufacturers about food hazards (19).

3.4. Microbiological Analysis

Plate count agar producing bacteria from the samples at various the lowetraditional market in Pontianak city (Table 2). The total plate count of the samples ranged from 2,1 x 10^7 - 7,0 x 10^7 Cfu/g, The highest total plate count was found in the sample from Mawar market at 7,0 x 10^7 Cfu/g, while the lowest was found in the sample from Flamboyan market at 7,0 x 10^7 Cfu/g. Based on this result showed that these samples from the different markets are still not considered as spoiled. Spoilage bacteria during aerobic storage, should be present $10^8 - 10^9$ Cfu/g to produce the significant amount of chemical compounds related to spoilage (20). We concluded that all of the samples are not considered as spoiled.
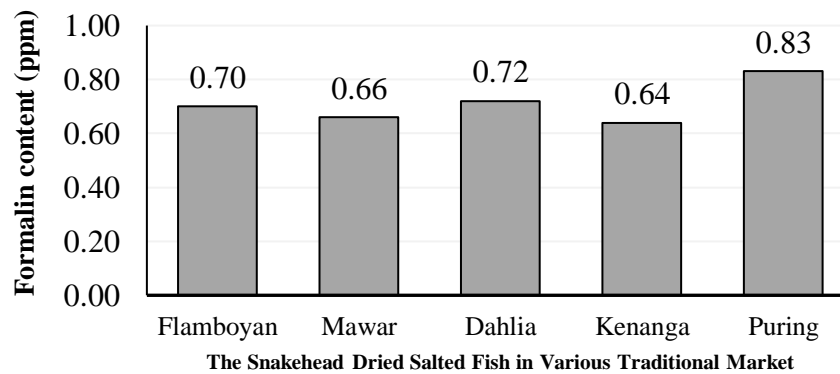
Figure 3. The Formalin Content On the The Snakehead Dried Salted Fish In The Traditional Market In Pontianak City

Table 2. Total Plate Count The Snakehead Dried Salted Fish At The Traditional Market In Pontianak City

Name of the traditional markets	Total Plate Count (Cfu/g)
Flamboyan	$2,1 \times 10^7$
Mawar	$7,0 \times 10^7$
Dahlia	$2,5 \times 10^7$
Kenanga	$2,4 \times 10^7$
Puring	$3,5 \times 10^7$

4. Conclusion

Based on this study, it concludes that all the samples are appropriate with SNI standard in salt content ranged from 7,08-8,49% and water content ranged from 36,66 – 39,04%. The level of panelists acceptance for appearance score ranged from 6,70–7,06 (whole, clean, slight dullness),the odor score ranged from 6,26 – 6,93 (neutral, slight odor additive - slight natural odor, slight odor additive), and the texture score ranged from 6,48 – 7,36 (solid, some loss of elasticity-very firm, some loss of elasticity). All the samples are contained formalin ranged from 0,64-0,83 ppm. The total plate count of the samples was found ranged from $2,1 \times 10^7$ - $7,0 \times 10^7$ Cfu/g. This study discovers of formalin contamination of the Snakehead dried salted fish in the traditional markets in Pontianak city. Therefore, the government and related institutions should make prevention efforts to solve this phenomenon.

Acknowledgments

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